



# PATENT SPECIFICATION

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209,648

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## COMPLETE SPECIFICATION.

### Means for Recovering Paper Stock.

I, FREDERICK WILLIAM GOLBY, Patent Agent, of 3, John Street, Bedford Row, London, W.C. 1, a British subject, do hereby declare the nature of this invention (a communication to me from abroad by American Reduction Co., of Pittsburgh, Pa., a corporation duly organized under the laws of the State of Pennsylvania, with offices at 1942, Forbes Street, Pittsburgh, State of Pennsylvania, United States of America), and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

In view of the present scarcity of paper pulp and other materials for the manufacture of various grades of paper and board, the conservation of waste paper has become a matter of considerable importance. However, the recovery of such stock from rubbish as ordinarily collected by municipalities and other agencies is a matter of great difficulty owing to the fact that the paper found therein is intermixed with a great variety of relatively useless articles, such as tin cans, old shoes, rubbers and the like; also that the material may be in the form of newspapers, magazines, and even books, as well as pasteboard cartons, wrapping paper, corrugated board, and boxes and the like. The cost of assorting rubbish to pick out this material has rendered the recovery unduly expensive. The object of the present invention, accordingly, is to provide an apparatus whereby recovery of this material may be automatically accomplished by mechanical means with a minimum expenditure of power, and at the same time with increased expedition.

The invention also is characterized by the provision of means for automatically preventing the collection of ropes or strings of fibrous material near the bottom portion of the drum through which collection otherwise the efficiency of the device would be impaired.

To the accomplishment of the foregoing and related ends, said invention, then, consists of the means hereinafter fully described and particularly pointed out in the claims, the annexed drawing and the following description setting forth in detail certain mechanism embodying the invention, such disclosed means constituting, however, but one of various mechanical forms in which the principle of the invention may be used. In said annexed drawing:

Fig. 1 is a side elevation of an apparatus embodying the present improvements;

Fig. 2 is a transverse section of the same taken on the plane indicated by the line 2—2, Fig. 1;

Fig. 3 is a broken longitudinal section of a detail of the apparatus, the plane of the section being indicated by the line 3—3, Fig. 2;

Fig. 4 is a longitudinal section through the drum shown somewhat diagrammatically to illustrate the arrangement of pegs for preventing the collection of fibres in the form of a rope;

Fig. 5 is a transverse section through the drum, and

Fig. 6 is a detail elevation of one of the pegs.

The principle element in the apparatus or mechanism as illustrated in the aforesaid drawing is a perforated drum, having its axis horizontally disposed and mounted so as to be rotatable about such axis. The perforations or slots X in the walls of said cylinder are arranged parallel to the axis of said cylinder and are preferably elongated in the direction of the length thereof. The said elongated perforations or slots serve to break up the paper stock into fibre and small pieces through the rubbing action of the paper stock contained in the drum across said slots or perforations during the rotation of the drum. The drum perforated as heretofore described also acts as a screen. Pre-

ferably said drum is suspended by means of chains or cables 2 from suitable pulleys 3, one of which is power driven, said chains or cables passing around rings or channels 4 on the drum. The ends of the drum are closed, as shown, so as to leave central openings 5 and 6 of approximately the relative dimensions indicated at the intake and discharge ends of the drum, respectively. Such discharge opening is somewhat larger than the intake opening, and has fitted into it a tubular extension 7, (see Fig. 1) perforated in the same fashion as the drum itself.

The drum is rotatably suspended, in the fashion just described, over an open tank or chamber 10 capable of retaining the water, or other equivalent liquid, the level of the latter being such as to extend within the drum to the height approximately as shown in Fig. 2. For example, in the case of a drum approximately 36 feet long by 9 feet in diameter, the lower side will be submerged to a depth of approximately 18 inches. The tank or chamber 10 is preferably formed out of concrete, and the one side wall 11 is lower than the other so as to provide a convenient overflow for the liquid from said tank in a laterally adjacent trough 12. From the latter the liquid may be pumped or allowed to overflow into other containers, as need not be described for the purpose in hand.

For supplying to the drum 1 the rubbish which is to be treated for the recovery of paper stock an inclined chute 15 is provided having its lower end projecting within the opening 5 at the corresponding end of said drum, said chute being arranged to receive the material in question from an endless belt conveyor 16, and a perforated pipe or suitable nozzles 17 being arranged to spray the water onto the material as it slides down the chute into the drum. The effect of such water spray will obviously assist in feeding the material into the drum.

At the discharge end of the drum I preferably mount in the interior angle formed between the cylindrical wall and the annular closure for such end, a series of triangular perforated plates 20, as shown in Fig. 3, the free inclined edges of each such plate being reinforced by means of a bar of angle iron 21. The inner ends 22 of these bars are curved to project radially into the opening 6, the flange on said bars facing in the direction of rotation which the drum is intended to have about its axis, as shown in Fig. 2. The effect of these plates 20, and of the bars 21, is to form a series

of scoops, which, as the drum rotates, will pick up any solid material arriving at the discharge end of the drum, lift the same above the liquid in the tank 10 and assist in discharging such material onto the tubular extension 7 that is inset in the opening 6. The plates 20 being perforated, as well as such extension, the liquid is given ample opportunity to drain from such solid articles as they are thus discharged, and the latter thereupon are dropped onto a second endless belt conveyor 23 where, by they are removed from the scene of operation. An inclined trough 24 is mounted below the extension 7 to collect the liquid that drains through the perforations in such extension. The number of plates 20 may be varied, four having been found suitable for the conditions ordinarily encountered.

Tubular extension 7 is desirably provided with a shallow internal flange 25 adjacent its outer end to prevent the pulp mixture from overflowing, and a relatively stationary perforated pipe 26 projects within said extension so as to direct a spray of water into the articles constituting the residual material discharged therethrough. Another perforated pipe 27 extends alongside the drum, exteriorly of its cylindrical surface, as shown in Fig. 2, so as to be adapted to spray water thereon and force back into the drum particles of pulp or paper stock which might otherwise lodge in the perforations.

In order to prevent the accumulation of rags and strings at the bottom of the drum, means are provided which break up intermittently any accumulation of this character. Rags and strings have a tendency to accumulate and to shape themselves owing to the rotary movement of the drum into a rope of considerable diameter and length depending upon the duration of the operation and also upon the length of the drum. When operated for five or six hours, this rope extended the full length of the drum and as it continuously rolled in the bottom, it obstructed a relatively large proportion of the available screening area—consequently reducing the pulping capacity of the drum. To overcome this, a plurality of pegs 30 are arranged in the drum and are secured in the wall of the drum, as for instance, by nuts 31 which are in engagement with the threaded shank 32 and which are located on the inner and outer wall of the drum respectively. These pegs grasp during the operation of the drum the accumulation of strings or the rope and catch the individual portions of the same which

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are usually formed of rags. The pegs, as illustrated in Figs. 4 to 6, are about six inches long with a drum of the dimensions stated by way of example above, and they are curved on the ends. These ends are turned in such manner that the rags catching on the pegs will not drop off until the pegs during the revolution of the drum have reached the uppermost part thereof. The pegs are, furthermore, twisted in another plane somewhat like the twist of a cork-screw portion so as to throw the rags forward or in the direction of flow of the material through the drum.

The operation of the apparatus just described may now be briefly indicated. The rubbish from which such major articles as wooden boxes, wash boilers and the like, which are of no value in the recovery process, are removed, is fed into the drum through a chute 15, and at the same time thoroughly saturated or wetted by means of the stream of water from the pipe 17, such water being preferably hot. As the drum rotates the mass of material accumulated within the same is turned over and over, clinging to the further side wall of said drum, having regard to the direction of rotation and then sliding back. The result is very quickly to reduce any paper stock, in whatever form it may be present in the rubbish, to a pulp condition, any desired degree of concentration of such pulp being obtainable by a proper regulation of the supply of water down the chute 15. The natural direction of flow of the mass of material within the drum will be from the intake to the discharge end, and as the latter is reached, the residuum, consisting of articles that are not capable of being thus pulped, is picked up by the successive plates 20 and discharged onto the extension 7 and finally onto the conveyor belt 23. I have found by actual tests that not only will the apparatus promptly reduce to the state of pulp loose sheets of paper of all kinds, but also cardboard boxes, corrugated board, whether in sheet or box form, as well as remove and pulp the paper labels on cans and other similar articles so as to leave the latter bright and clean when they are finally discharged. The pulp mixture escapes of course through the perforations in the drum and gradually overflows from the tank 10 into the adjacent trough 12, whence it may be removed for further concentration if desirable, although I have found that it is possible to make a pulp of sufficient concentration to permit of the immediate

fabrication therefrom of sheets such as are saleable to paper manufacturers. 65

During this operation, it also has been found that the rags which otherwise would accumulate at the bottom of the drum were carried up by the pegs 30 along one side of the drum and then dropped back to the bottom. Owing to this continuous breaking up of the rope formed of rags and strings, this material has no opportunity to accumulate and to become rolled up in a rope at the bottom. 70 75

While my invention has been described with particular reference to the recovery of paper stock from rubbish, it will be obvious that the foregoing apparatus, as well as the process exemplified in its operation, may be advantageously utilized in treating paper stock from whatever source derived. For example, such apparatus will serve to reduce to pulp, waste paper of all kinds, not previously treated with waterproofing preparations, replacing to a large extent the familiar beater at present employed for this purpose. Whatever the particular use thus made of the apparatus, it permits of a material reduction in power and labor required over the process commonly employed. 80 85 90 95

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:— 100

1. In an apparatus for recovering paper stock a drum rotatably supported and partially submerged in liquid, the drum having intake and discharge openings at its ends and having slots through which the liquid in which the drum is partially submerged may also enter the interior of the drum, and means for breaking up paper stock in the interior of the drum into fibre and small pieces. 105 110

2. An apparatus for recovering paper stock, as set forth in Claim 1, including a suitable tank for containing liquid and in which the drum is submerged while being rotatably supported with respect to said tank. 115

3. An apparatus for recovering paper stock, as set forth in Claim 1, in which the slots in the walls of the drum are arranged parallel to the axis thereof and are elongated. 120

4. An apparatus for recovering paper stock, as set forth in Claim 1, including means adapted to remove the residual material through the discharge opening of the drum during the rotation of the drum. 125

5. An apparatus for recovering paper stock, as set forth in Claims 1 and 4, in

- which the means for automatically removing the residual material include a perforated plate mounted in the interior angle formed between the cylindrical wall of the drum and the adjacent end wall thereof and an angle bar reinforcing the free edge of the plate and having an end projecting into the discharge opening.
- 6 6. An apparatus for recovering paper stock, as set forth in Claims 1 and 5, including on the reinforcing bar a flange which faces in the direction of rotation of the drum.
- 10 7. An apparatus for recovering paper stock, as set forth in Claims 1 and 2, including a liquid tank having one lateral wall higher than the other lateral wall and an overflow trough connected to the lower wall of the tank.
- 15 8. An apparatus for recovering paper stock, as set forth in Claim 1, including means in the interior of the drum for breaking up accumulations of rags, strings and ropes which are formed by the residual material at the bottom of the drum.
9. An apparatus for recovering paper stock, as set forth in Claims 1 and 8, in which the means for breaking up accumulations of strings and rags include a plurality of pegs projecting from the wall of the drum inwardly.
- 30 10. An apparatus for recovering paper stock, as set forth in Claims 1 and 9, including on the pegs portions for retaining accumulated soft material in connection with the pegs and for imparting upon the release of said material, to the material a movement in the forward direction of the drum.
- 40 11. An apparatus for recovering paper stock, substantially as described and shown, and for the purpose set forth.
- Dated this 3rd day of April, 1923. 45
- F. W. GOLBY,  
Patent Agent,  
3, John Street, Bedford Row, London,  
W.C. 1.

[This Drawing is a reproduction of the Original on a reduced scale]

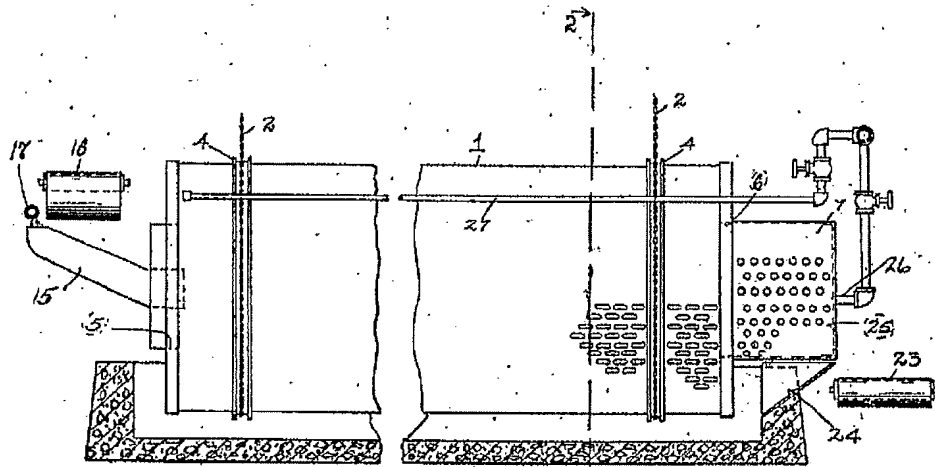


Fig. 1

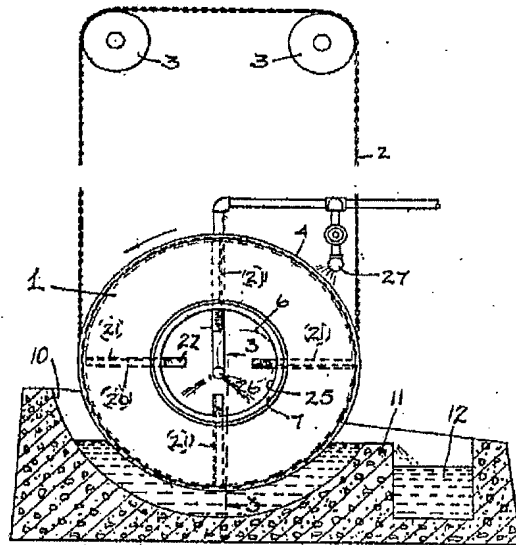


Fig. 2

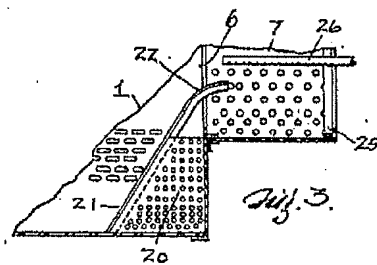
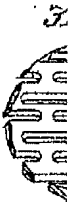
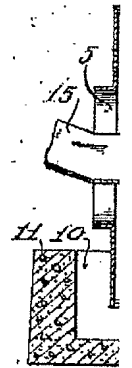
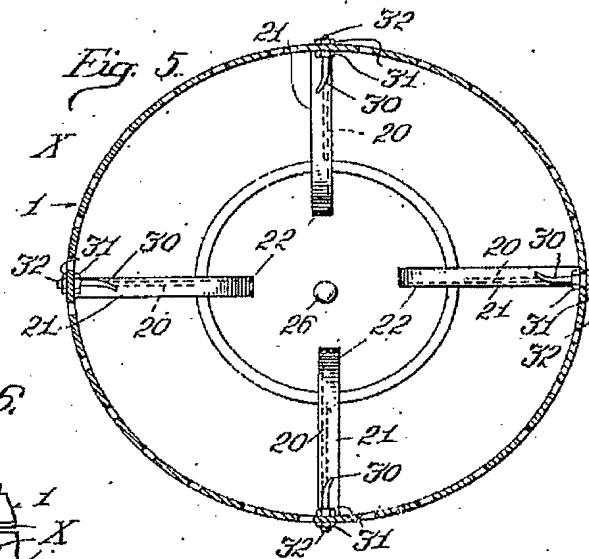
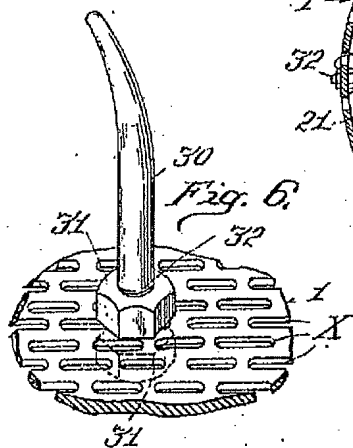
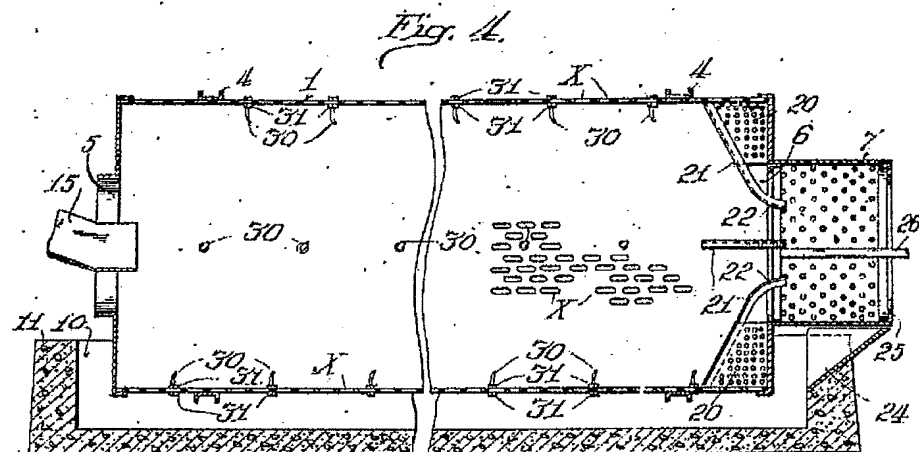
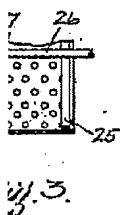
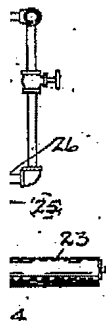


Fig. 3





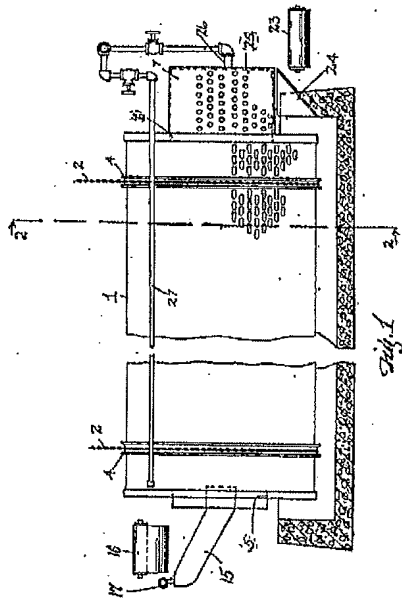


Fig. 1

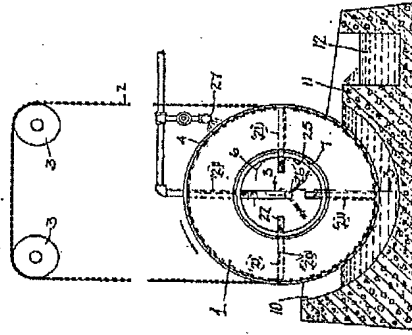


Fig. 2

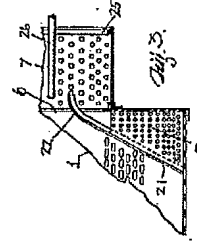


Fig. 3

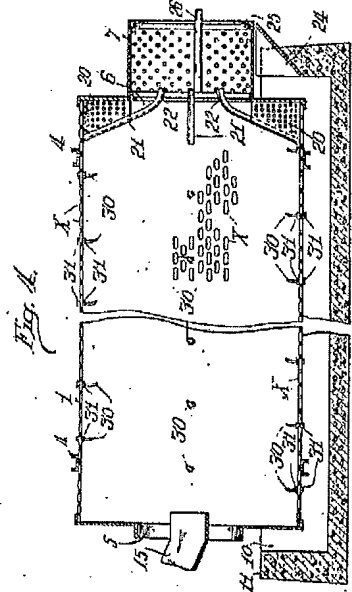


Fig. 4

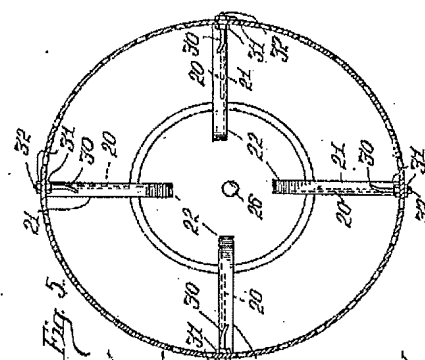


Fig. 5

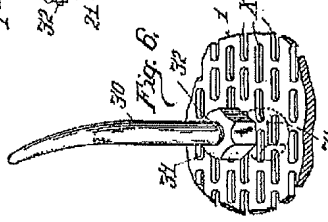


Fig. 6

[This Drawing is a reproduction of the Original on a reduced scale]